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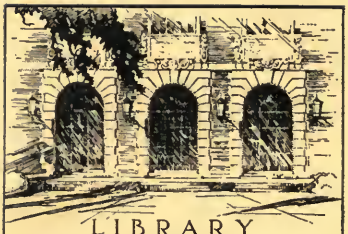

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GEOLOGICAL SERIES
OF
FIELD MUSEUM OF NATURAL HISTORY

Volume VI | CHICAGO, MAY 15, 1935 | No. 10

A NEW NIAGARAN CONULARIA

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Several specimens representing the new species of *Conularia* described and figured in this paper have recently been found in the Lecthaylus shale (Niagaran), near Blue Island, Illinois (S. K. Roy: A New Silurian Phyllopodous Crustacean, Field Mus. Nat. Hist., Geol. Ser., **6**, No. 9, p. 141). The first, a fragmentary one, was collected by Mr. Floyd Markham, of Chicago. Later, Messrs. J. Mann and A. Lees, of Oak Lawn, Illinois, and myself found several other specimens, one of which was particularly suitable for descriptive purposes. Unlike the associated fossils, which are all very highly carbonized, these specimens have undergone little or no carbonization.

It is of interest to note here that this type of *Conularia* has not been previously found in North America. The vertical range of this group in Europe, so far as known, is extremely limited, and, as such, it may serve as an excellent guide in correlating formations in which it occurs.

The writer is greatly indebted to Messrs. Markham, Mann, and Lees for helping him in the field and for presenting their entire collection to the Museum. The photomicrographs are by Mr. Frank H. Blackburn of the University of Chicago and Mr. Markham, and the photographs are by the Staff Photographer of Field Museum, Mr. C. H. Carpenter.

SPECIFIC DESCRIPTION

Conularia manni Roy sp. nov. Figs. 30–32.

Diagnosis.—Shell of medium size, having the form of a straight four-sided pyramid; extremely thin, composed of two distinct layers, the outer wine-colored and ornamented, the inner lighter and bearing the impression of the under side of the outer layer; faces equal, tapering uniformly. Cross section square. Apical angle 39°–42°. Marginal grooves narrow, shallow; central facial groove inconspicuous, flanked by a pair of internal raised longitudinal ribs which

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converge gently (at the rate of 1 mm. in 15) towards the apex and which are marked by blackish lines. Apex pointed. Ornamentations extremely fine, hardly visible with the unaided eye; transverse ridges very fine and densely packed (45± in 5 mm.), moderately arched (becoming slightly angular at the crest) across each face, meeting at an obtuse angle and continuing without break over the marginal grooves, ridges studded with small, irregularly placed subrounded tubercles (105± in 5 mm.); average angle formed by the two halves of each of the transverse ridges on the facial groove 117°. Furrows smooth.

The aperture is not preserved in any of the specimens in the present collection.

Dimensions.—Greatest length and width of face seen, 54 mm. and 30 mm., respectively.

Remarks.—Apparently the subject of morphological subdivision of *Conularia* has not drawn as much interest as has its systematic position in the animal kingdom. Nevertheless, several attempts at a natural grouping of the species of the genus have appeared since Barrande's paper of 1867. The important ones are those by Lindström (1884), Holm (1893), and Boucek (1928). It is not the purpose of this paper to evaluate these groupings but simply to give their general scope, in order that the group to which *C. manni* belongs may be comprehended and compared with other groups.

Lindström separated the genus *Conularia* into three subdivisions based on the surface characters of five species. The three groups are:

I. Surface of the shell ornamented by transverse ridges studded with tubercles (*C. cancellata* Sandb. and *C. monile* Lindstr.).
II. Surface of the shell ornamented by smooth transverse ridges (*C. laeves* Lindstr.).
III. Two segmental lines ("internal septa") run in the middle of the faces (*C. aspersa* Lindstr. and *C. bilineata* Lindstr.).

Holm proposed a subdivision consisting of four sections based on a study of seventeen species. He, like Lindström, followed the surface characters as the basis of his groupings. His sections are:

I. *Laeves.* Surface smooth, without ridges but frequently with transverse undulations (growth lines).
II. *Longitudinales.* Surface ornamented throughout with longitudinal ridges, the segmental line having the form of a carina.
III. *Moniliferae.* Surface ornamented with transverse ridges or tubercles arranged in transverse rows. A. Internal longitudinal ribs present down the center of each face; B. Internal longitudinal ribs not present.
IV. *Cancellatae.* Surface of the shell covered with strong transverse ridges usually cut by very fine longitudinal ridges (cancellated ornamentation).

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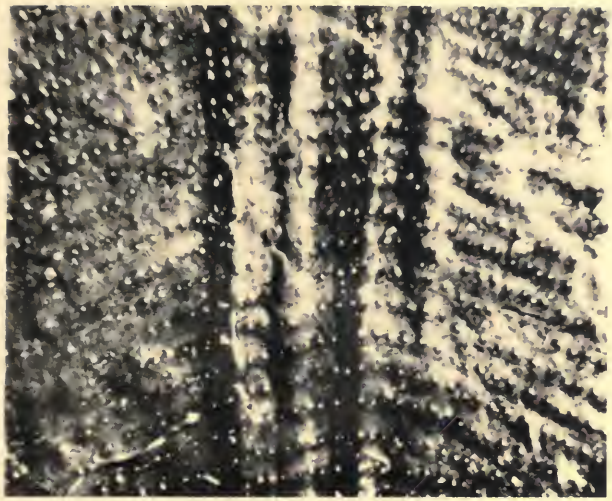
FIG. 30. *a, Conularia manni* Roy sp. nov. A nearly perfect specimen, flattened by compression, resulting in contact between upper and under faces. In certain places, four longitudinal ribs instead of two are seen. Two extra ribs belong to under face but are made visible here by compression and flattening of faces. x 3½. F.M. No. P23674. Photograph No. 78418.

The most elaborate subdivision is that of Boucek's. He studied forty-two species, from which he segregated three, *C. robusta* Barr., *C. purkynei* Zel., and *C. sulca* Zel., in a new genus *Conulariella* and subdivided the remaining species into seven groups, taking into consideration the criteria employed by Holm but laying particular emphasis on the following characters: (*a*) character of the principal segmental line (groove or crest), (*b*) characters of secondary and accessory segmental lines, (*c*) course of transverse ridges (rectilinear or inflected), and (*d*) inflection of the transverse ridges toward the summit of the shell or toward the buccal orifice. Each of Boucek's seven groups is supplemented by a detailed key, enumeration of which (with the exception of that to which *C. manni* is related) does not seem necessary here. Further, each group bears the name of a species believed to be the typical representative of that group. The seven groups are:

I. *C. insignis* Barr.
II. *C. fecunda* Barr.
III. *C. exquisita* Barr.
IV. *C. solitaria* Barr. (along the principal segmental line and very near to it run two secondary segmental lines).
V. *C. fragilis* Barr.
VI. *C. proteica* Barr.
VII. *C. grandissima* Barr.

The outstanding feature of *C. manni* is the pair of converging internal longitudinal ribs ("internal septa" of Lindström and "secondary segmental lines" of Boucek) that flank the facial grooves ("principal segmental line" of Boucek) on the faces of the shell—a feature which immediately places it in Group III of Lindström, Section III (Moniliferae. A) of Holm, and Group of *C. solitaria* of Boucek. Up to the time of writing this paper, the *C. solitaria* group contained but five species, *C. solitaria* Barr., *C. aspersa* Lindstr., *C. bilineata* Lindstr., *C. punctata* Slat., and *C. solitaria* Barr. var. *longistriata* Boucek. *C. manni*, therefore, is the sixth of this small but well-defined group and the first to be recorded from North America.

The nature of the paired internal longitudinal ribs, as well as of the black lines accompanying them, is not very well understood. Lindström, Holm, Slater, and Boucek did not adequately explain these structures. The longitudinal ribs are found sandwiched between the outer and inner layers of the shell. This is quite apparent



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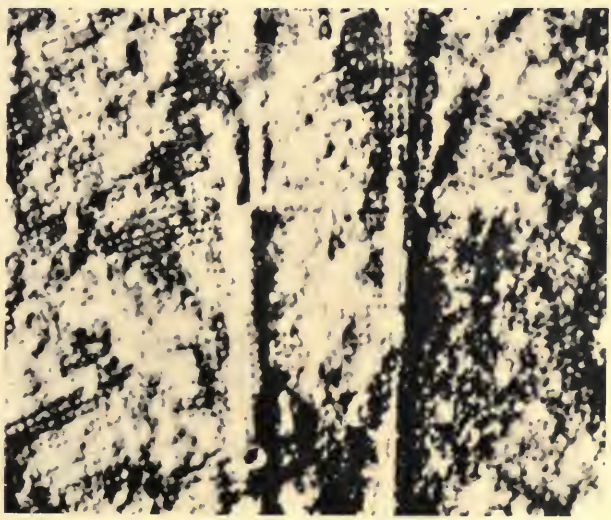

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FIG. 31. *Conularia manni* Roy. *a*, Portion of two faces in contact showing four longitudinal ribs, two of which belong to under face. x 33. F.M. No. P23507. *b*, Portion of paired longitudinal ribs, showing relationship and contact between upper and lower layer of shell. x 13. F.M. No. P23674.

wherever the outer layer is missing or has been flaked off (fig. 31*b*). The ribs are solid. When loosened and removed, which can be done with a pin under favorable circumstances, they leave a narrow opening between the layers suggesting tubes that were filled up during fossilization. I am inclined to believe, however, that they were solid structures from the beginning and were supports that helped to maintain the pyramidal shape of the shells. The shells are so thin that it seems entirely probable that they needed some sort of support in order to maintain their rigidity. From the nature of the preservation of the shells, it is evident that even with the support the ribs might have supplied, they were extremely liable to compression. In the present collection, examples of compression resulting in contact between the upper and under faces are not rare. In cases of such compression, two pairs of ribs (fig. 31*a*) instead of one occupy the median portions of the faces; the extra pair, as may be deduced, belong to the under face but is rendered visible through the upper face by the compression and flattening of the shell.

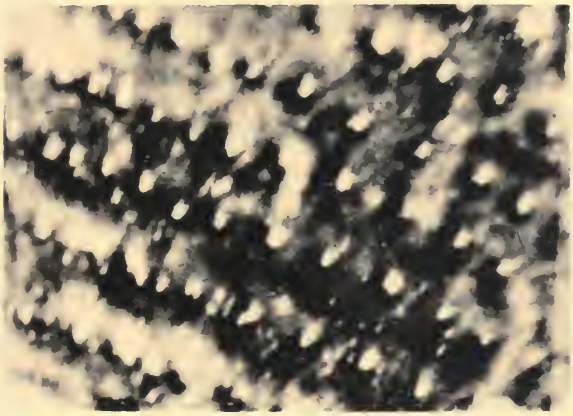
The black lines, mentioned above, which either accompany or cover the longitudinal ribs are not "positions of some important anatomical structures" as has been suggested by Slater (1907, p. 6, l.11). They do not have any definite form and cannot be considered as a part of the anatomy of the animal. Under the microscope the black lines appear like stains of some kind, most likely products of decomposition or some constituents of the shell that have concentrated along the ribs which, being raised structures, have offered resistance for even diffusion. Further evidence in support of this view is the fact that similar stains have been observed elsewhere in the shells, particularly near the apical portions.

Affinities.—The relationship of the present species to its allies has already been mentioned. Its closest resemblance is with *C. aspersa*, from which, and from all others, it is easily distinguished by its wide apical angle and the angles formed by two halves of the transverse ridges. The apical angle of *C. manni* is the widest of all the species belonging to the *C. solitaria* group.

The specific name is associated with one of the donors, Mr. J. Mann.

Horizon and locality.—Lecthaylus shale, Upper Lockport group (Niagaran), Blue Island, Illinois.

Holotype: No. P23674. Paratypes: Nos. P23507 and P23674 Field Museum.



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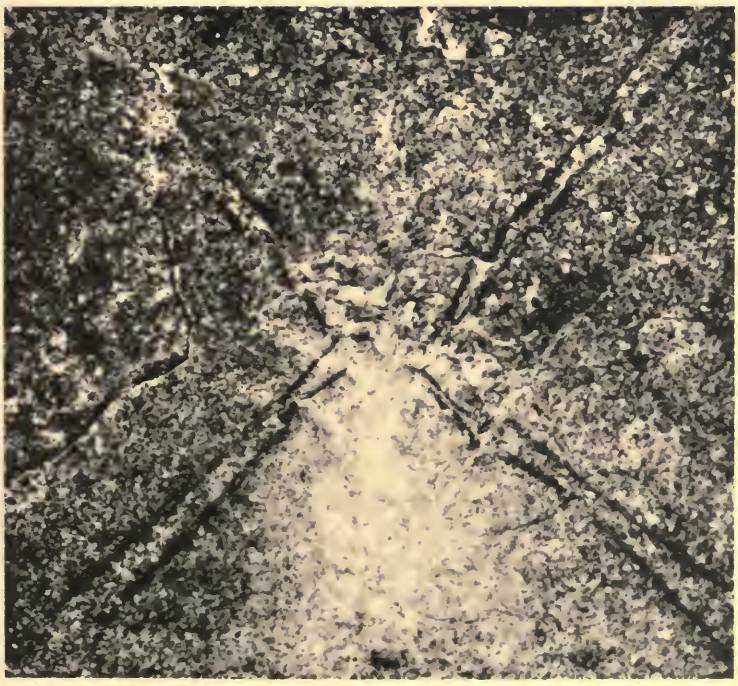

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FIG. 32. *Conularia manni* Roy. *a*, Enlarged tubercles of transverse ridges. x 99. F.M. No. P23507. *b*, Apical view. Four faces now detached from one another and shell radially flattened by pressure. Two faces on left attached to each other at apices as are also those on right, but two halves of shell have been detached and slightly shifted. F.M. No. P23674.

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